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(19) (CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Hockey Stick Blade Unit

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(57) 20 Claims

Notice: This application is as filed and may therefore contain an incomplete specification.

Canada

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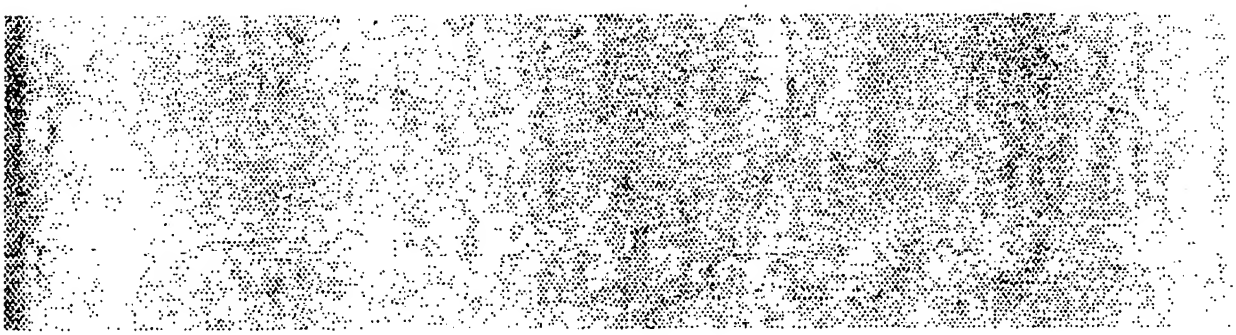
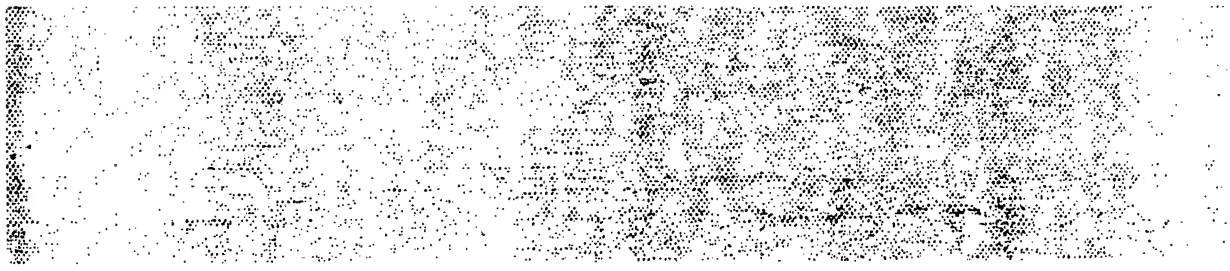


ABSTRACT OF THE DISCLOSURE

A hockey stick blade unit includes a single molded plastic member having a rigid, synthetic foamed inner core with a synthetic exterior skin extending thereabout. The member has reinforcing fibers dispersed therethrough. The member includes a shank with a shaft receiving portion and a blade. The lower portion of the shank is connected to the blade. The member is made by injection molding a single plastic member having a blade and a shank. Preferably an aluminum mold is injected with the synthetic, fiber reinforcement and a foaming agent. The complete hockey stick is formed by connecting a shaft onto the shank, preferably by heat shrinking.

HOCKEYBLADE



SINGLE PIECE HOCKEY STICK BLADE UNIT AND METHOD

BACKGROUND OF THE INVENTION

Field of the Invention

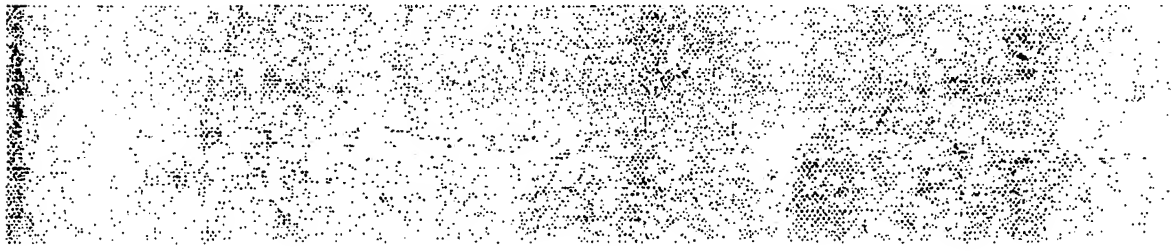
This invention relates to hockey stick blades, and in particular to hockey stick blade units of synthetic materials which are adapted to be replaceably affixed onto a shaft to form the entire stick.

Description of Related Art

Conventionally hockey sticks have been made of wood with the blade of the stick being affixed to the shaft by a rabbet joint and an adhesive. It is well recognized by hockey players that such conventional sticks frequently have a short life span even if the blade is protected by tape. It is difficult to obtain wood of sufficiently high quality and even that is subject to considerable variation in strength. Even the best wood in hockey sticks breaks in use, particularly when subjected to the extreme forces encountered during professional league play. Furthermore, it is difficult to give wooden hockey sticks the exact characteristics desired by professional players. As a result of both of these factors, there has been a tendency to move towards non-wooden sticks.

For example, United States Patent No. 3, 934, 875 Easton et al. discloses a fiber filled plastic blade. The blade is mounted on an aluminum alloy tube which attaches to the shaft or handle. The mounting of the reinforced plastic blade on the shaft is accomplished by means of a separate aluminum alloy shank. The shank has a tapered lower portion which is embedded into a vertical extension of the blade. The upper portion of the shank is rectangular is section and fits within a rectangular socket at the bottom of the shaft.

However, this hockey blade suffers a number of potential drawbacks. For one thing, the blade is heavier than desirable because of the metal shank and the weight of the blade itself which is made of glass fiber reinforced plastic. Second, the blade is prone to damage due to separation of the shank from the rest of the blade and separation between the shank and the shaft which are connected by an adhesive.



SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved blade unit for a hockey stick which is lighter in weight than prior blade units but retains the necessary strength.

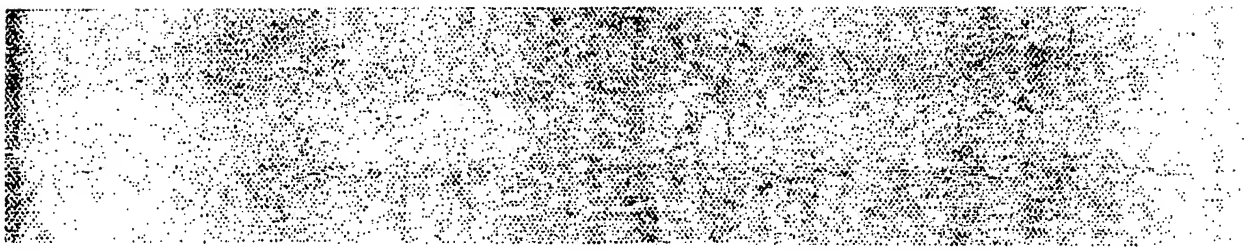
It is another object of the invention to provide an improved hockey stick blade unit which is more durable in play than previous blade units.

It is a further object of the invention to provide an improved hockey stick blade unit which is economical to produce and market.

It is a still a further object of the invention to provide an improved method of connecting hockey stick blade units to shafts so that the two do not separate even under extreme forces encountered during play.

In accordance with these objects, one aspect of the invention provides a hockey stick blade unit, comprising a single molded plastic member having a top, a bottom, opposite sides, a shank, a blade having a tip and a rigid synthetic foamed inner core with a synthetic exterior skin extending thereabout. The member has reinforcing fibers dispersed therethrough. The shank has a shaft receiving portion adjacent the top of the blade. The shaft receiving portion is rectangular in section. The shank has a lower portion connected to the blade. The sides of the member taper inwardly towards the tip of the blade, whereby the member is thinnest adjacent the tip.

Another aspect of the invention provides a method of making hockey stick blade units. The method comprises the injection molding of a single plastic member having a blade and a shank. Preferably the blade unit is injection molded utilizing an aluminum mold for example. The mold may be injected with a synthetic having a foaming agent and fiber reinforcement.



A still further aspect of the invention provides a method of assembling a hockey stick. The method comprises securing a metal shaft, having a socket at a bottom end thereof, to a one-piece blade unit having blade and a shank of fiber-reinforced synthetic foam with a synthetic skin extending thereabout. The shaft is secured to the blade unit by heating the bottom end of the shaft to expand the socket, fitting the socket over the shank, and allowing the bottom end of the shaft to cool to shrink the recess tightly about the shaft.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Fig. 1 is a top, side isometric view of a hockey stick blade unit according to an embodiment of the invention;

Fig. 2 is a front elevation thereof;

Fig. 3 is a top plan thereof; and

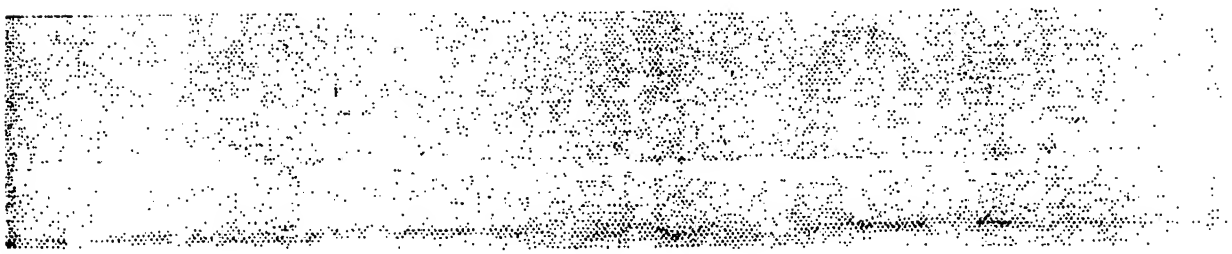
Fig. 4 is a sectional view taken along line 4-4 of Fig. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings, these show a hockey stick blade unit 10 which comprises a single piece molded plastic member 12. The member has a tip 14, a bottom 16, opposite sides 18 and 20, a shank 22 and a blade 24.

The shank has a shaft receiving portion 26 which is generally rectangular in section as seen best in Fig. 3. However, it has four rounded corners as shown, for example, by corner 28. The shaft receiving portion is of substantially constant cross-section apart from a rounded top 30.

The shank also has a lower portion 32 which is connected to blade 24 and



merges therewith adjacent bottom 34 of the shank. As may be seen best Fig. 2, the sides 18 and 20 of the member taper towards each other along the lower portion 32 of the shank such that the shank is the thinnest adjacent the bottom 34 and the thickest at a point 36 below the shaft receiving portion 26. There is a reverse tapered portion 38 of the shank between the lower portion 32 and the shaft receiving portion 26 which tapers from a larger cross section at point 36 adjacent the lower portion to a smaller cross section at a point 40 adjacent the shaft receiving portion 26.

As may be seen best in Fig. 1 and 3, the tapering of member 12 continues along the blade 24 towards the tip 14 such that the member is the thinnest adjacent the tip. It may also be seen in this preferred embodiment that the corners of the member, such as corner 42 extending along top 44 of the blade and front 46 of the shank, are rounded. In general, the shape of the blade and shank up to point 36 are generally similar to a conventional hockey stick.

The member 12 of this embodiment is a single piece of molded plastic. A number of synthetic materials could also be used. In this embodiment the material employed is nylon 6 although nylon 6/6 could also be utilized as could high impact polyurethane. The synthetic material is reinforced with fibers. In this particular example the fibers are a 12.5% graphite/carbon fibers with 37.5% short glass fibers. The percentages relate to the fiber content of the member by weight. The rest of the material is nylon or other synthetic. Boron fiber may also be used to supplement or replace the graphite/carbon fiber. Kevlar may supplement or replace the short glass fiber.

As seen best in the sectional view of Fig. 4, the synthetic has a foamed core 48 surrounded by a skin 50 which completely surrounds the number 12 to enclose the foamed core. The skin is of the same synthetic material as the core in this example.

Method of Molding

The member is one step injection molded in this example. The mold is preferably aluminum instead of the usual steel because of the high heat transfer rate of aluminum. This allows the mold to be quickly cooled after it is injected with the

hot synthetic to form the skin 50 discussed above. An end gate is preferably used on the mold and the material flows towards the tip 14.

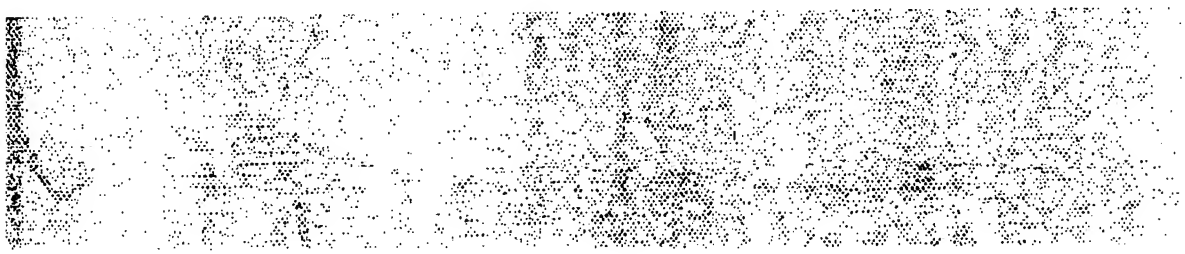
The mold is charged with a conventional screw filled with the synthetic material, such as nylon, in shot form, the reinforcing fibers and a foaming agent. The foaming agent may be endothermic or exothermic. In this example RTP-BAFCX 26310 is used. Enough foaming agent is used to achieve a density reduction percentage of approximately 26.5%. In other words, the foamed blade weighs 26.5% less than an unfoamed unit of the same size.

To obtain maximum foaming action, a low profile injection screw is used in this example. The screw has a length between 1,200mm and 1,500mm. The length of the screw effects the compression ratios which should not be less than 2:1 and not more than 4:1. The injection speed is in the medium to fast range.

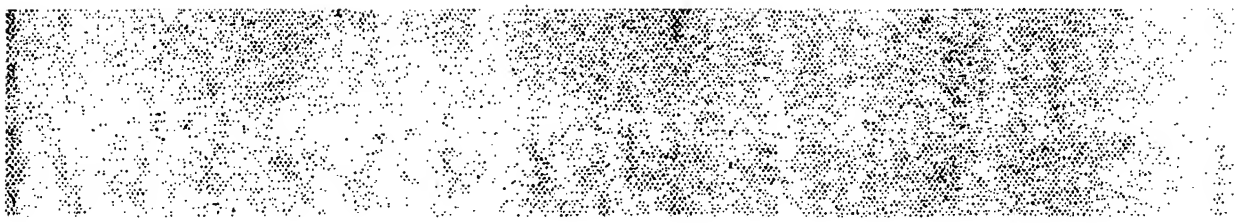
The size of the shot depends upon the particular molding machine and other such factors. A closed loop is used for maximum replication. The holding time and cooling time are normal for this type of component. The profiled barrel temperatures are important. The heater band temperatures should not be less than 300 F. and should not exceed 600 F.

Method of Assembly

The bottom portion of a shaft 52 is shown in stippled lines in Fig. 2 and 3. The shaft has a recess 54 formed in the bottom 56 thereof which is adapted to receive portion 26 of shank 22. The recess 54 is generally similar in shape to portion 26, but is slightly smaller in cross section. The shaft 52 is fitted onto member 12 by heating the bottom portion of the shaft adjacent recess 54. The shaft is conventionally of aluminum and the heating causes the aluminum to expand including recess 54. Portion 26 of the shank is then inserted into the recess. The shaft is cooled and this causes the shaft to shrink onto the shank. This forms a permanent and very tight bond. Alternatively, the shaft could be connected to the shank by an adhesive. An adhesive could also be used to supplement the heat shrinking process.



It will be understood by someone skilled in the art that many of the details provided above are by way of example only and are not intended to limit the scope of the invention which is to be interpreted with reference to the following claims.



WHAT IS CLAIMED IS:

1. A hockey stick blade unit, comprising:

a single molded plastic member having a top, a bottom, opposite sides, a shank, a blade having a tip, and a rigid synthetic foamed inner core with a synthetic exterior skin extending thereabout, the member having reinforcing fibers dispersed therethrough;

the shank having a shaft receiving portion adjacent the top of the blade which is rectangular in section, and a lower portion connected to the blade, the sides of the member tapering inwardly towards the tip of the blade, whereby the member is thinnest adjacent the tip.

2. A unit as claimed in claim 1 wherein the shank has a reverse tapered portion between the lower portion and the shaft receiving portion which tapers from a larger cross section adjacent the lower portion to a smaller cross section adjacent the shaft receiving portion.

3. A unit as claimed in claim 2, wherein the shaft receiving portion has a substantially constant cross section.

4. A unit as claimed in claim 1, wherein the synthetic is nylon.

5. A unit as claimed in claim 1, wherein the synthetic is polyurethane.

6. A unit as claimed in claim 1, wherein the fiber is graphite fiber.

7. A unit as claimed in claim 1, wherein the fiber is a mixture of graphite fiber and short glass fiber.

8. A unit as claimed in claim 1, where in the member is of nylon and has 12.5% graphite or carbon fiber and 37.5% short glass fiber.

9. A unit as claimed in claim 1, wherein the unit has a weight 26.5% less than an unfoamed unit of the same volume.

10. A unit as claim in claim 1, wherein the foamed core and the skin are of the same synthetic.

11. A method of making hockey stick blade units, comprising: injection molding a single plastic member having a blade and a shank.

12. A method as claimed in claim 11, wherein the member is injection molded utilizing an aluminum mold.

13. A method as claimed in claim 11, wherein the mold is injected with plastic, fiber reinforcement and a foaming agent.

14. A method as claimed in claim 13, wherein the plastic is nylon.

15. A method as claimed in claim 13, wherein the plastic is polyurethane.

16. A method as claimed in claim 13, wherein the fiber reinforcement is graphite.

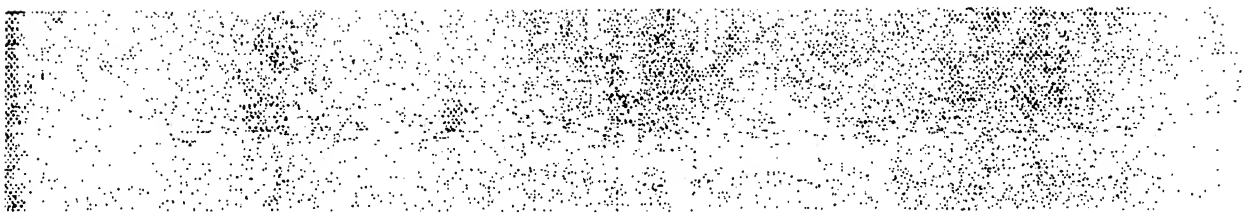
17. A method as claimed in claim 12, wherein the mold is injected using a low profile injection screw.

18. A method as claimed in claim 17, wherein the injection screw is 1,200mm to 1,500mm long.

19. A method as claimed in claim 13, wherein a mold with an end gate is used.

20. A method of assembling a hockey stick, comprising:

securing a metal shaft, having a socket at a bottom end thereof, to a one piece blade unit having a blade and a shank and being made of fiber-reinforced synthetic foam with a synthetic skin extending thereabout, the shaft being secured to the blade unit by heating the bottom end of the shaft to expand the socket, fitting the socket over the shank and allowing the bottom end of the shaft to cool to shrink the socket tightly about the shank.



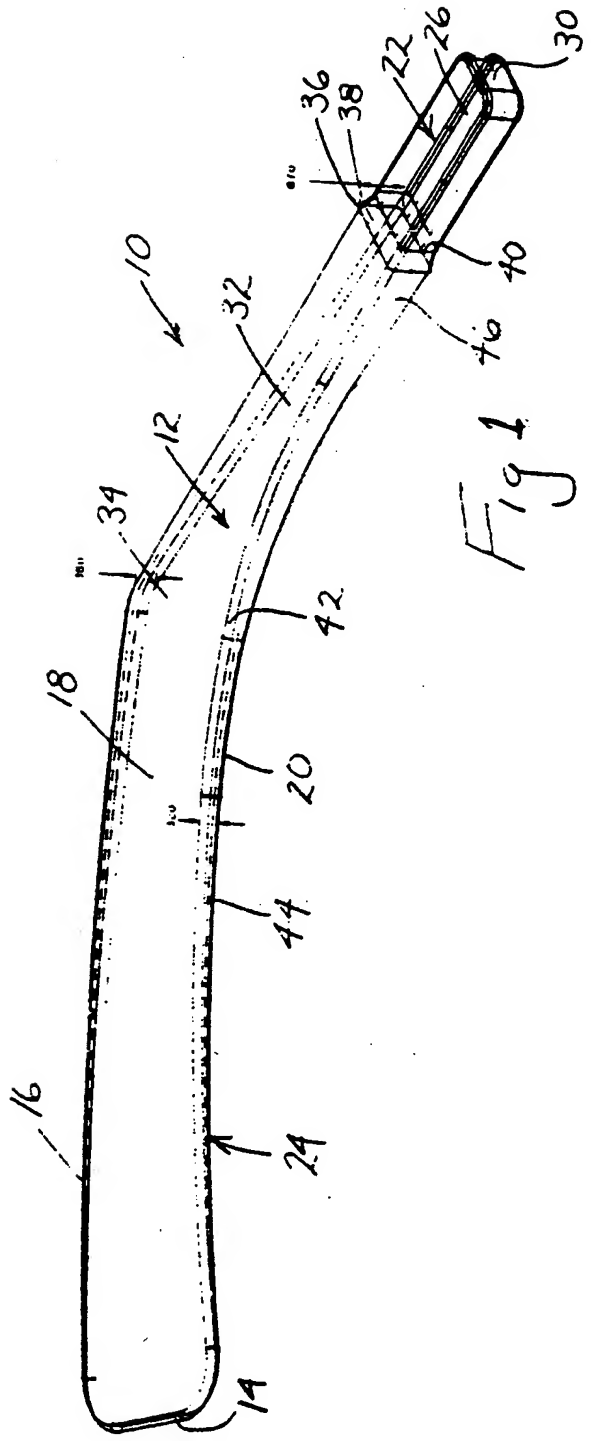


Fig 1

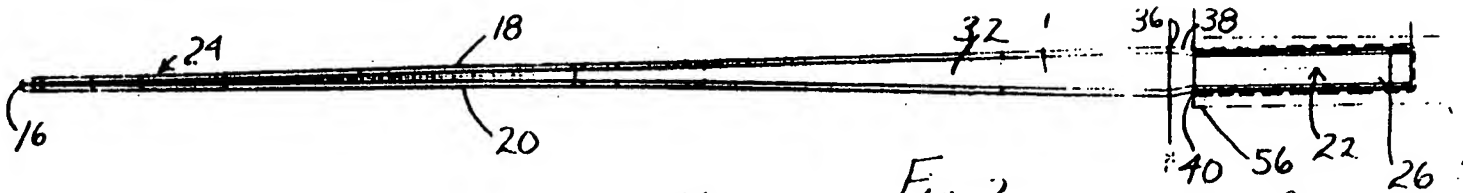


Fig 2

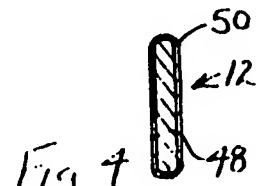


Fig 4

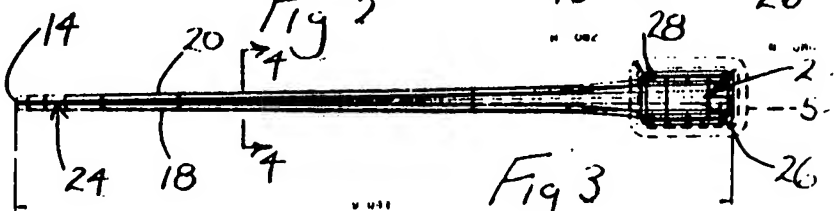


Fig 3

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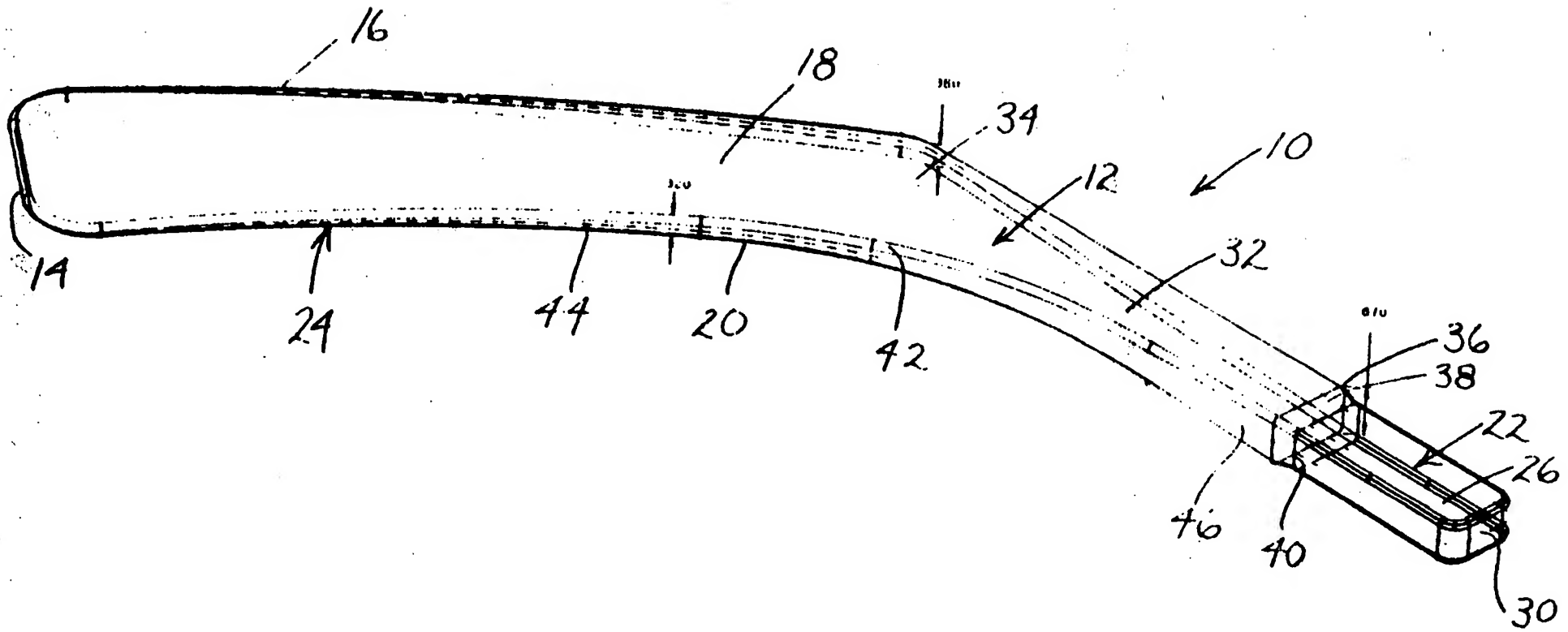
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